# CS 2310: Multimedia Software Engineering
# Exercise 3

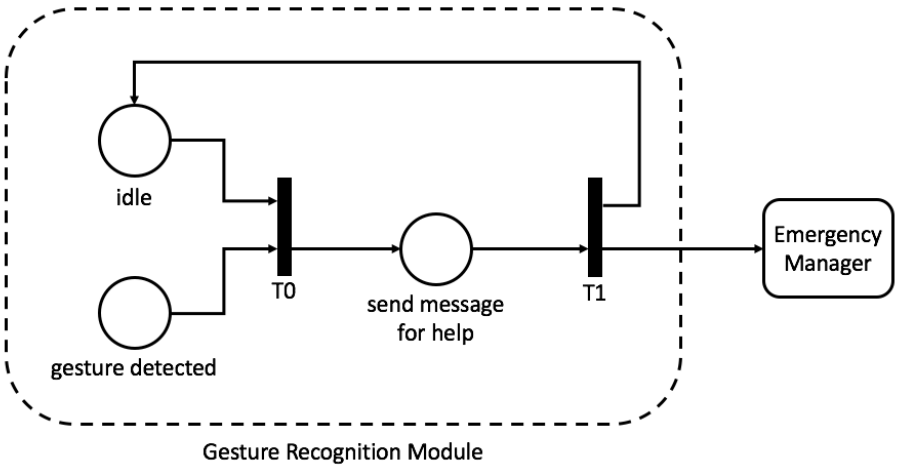
Mingda Zhang / miz44
mzhang@cs.pitt.edu

## Requirement

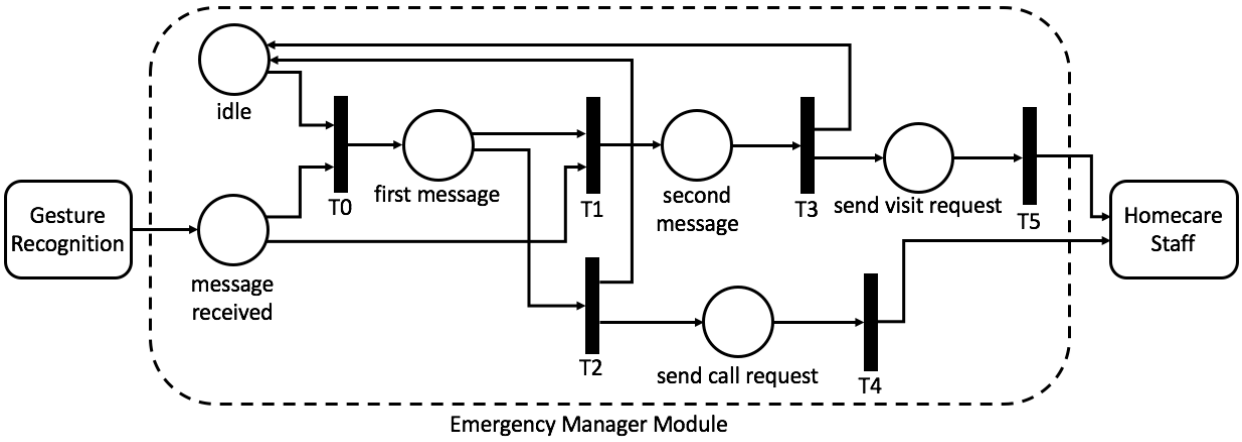
The purpose of this exercise is to understand the relationship between active index and Petri nets. Both are tools for the modeling of distributed multimedia systems. Active index cells are added incrementally to build a dynamic index, and the connections can also change dynamically. However, if the massages passed between index cells are deterministically routed, then it is possible to convert active index into a Petri net. Otherwise you must use a Petri net with conditions (predicates) associated with the transitions, or an Evaluation Net (E-net).

## (a) Convert the active index you constructed in Exercise 2 into a Petri net (or an E-net).

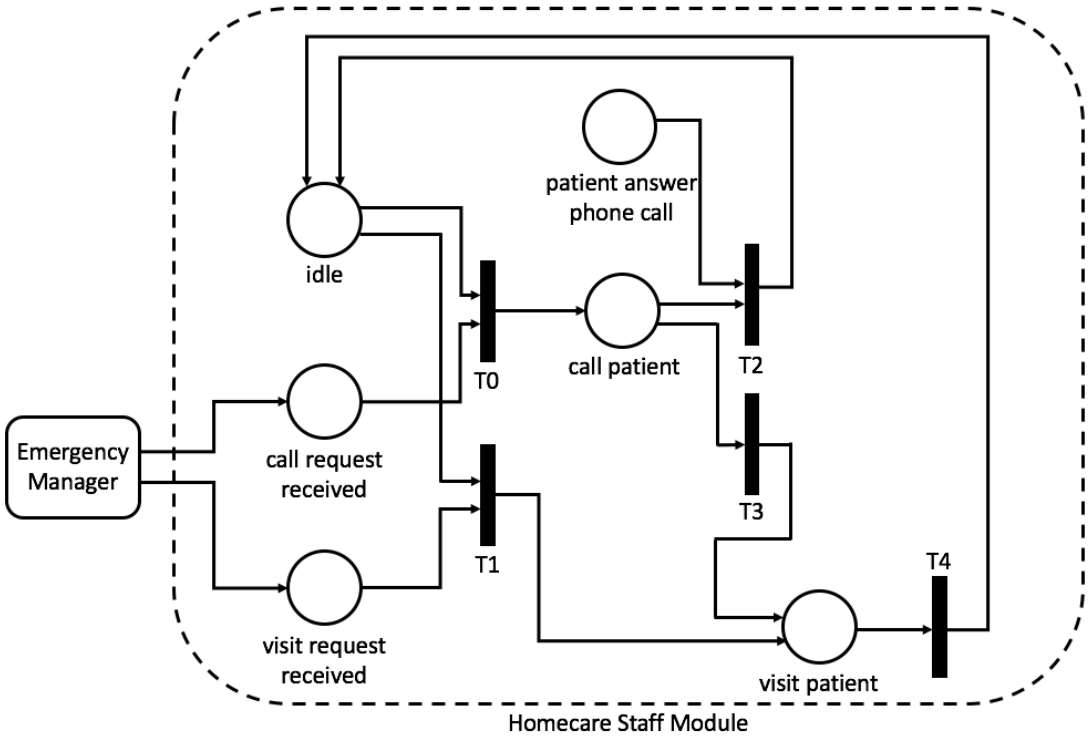
**Gesture Recognition Index Cell**




**Emergency Manager Index Cell**



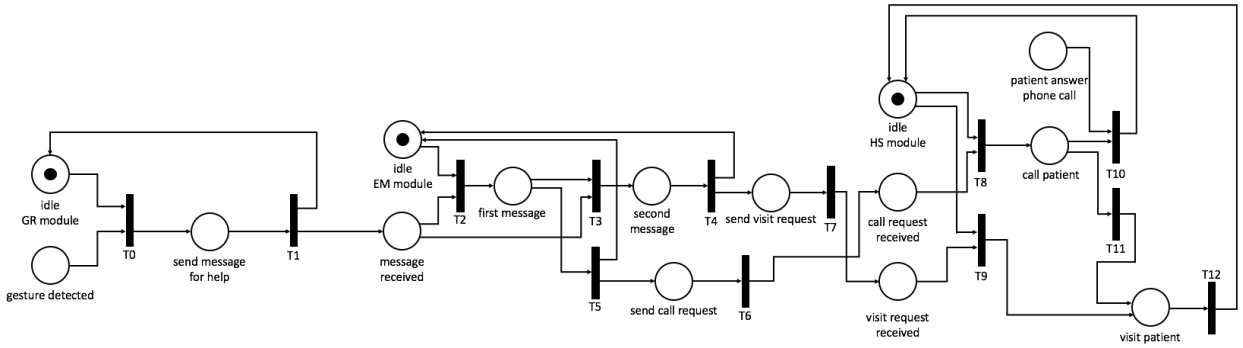

**Homecare Staff Index Cell**



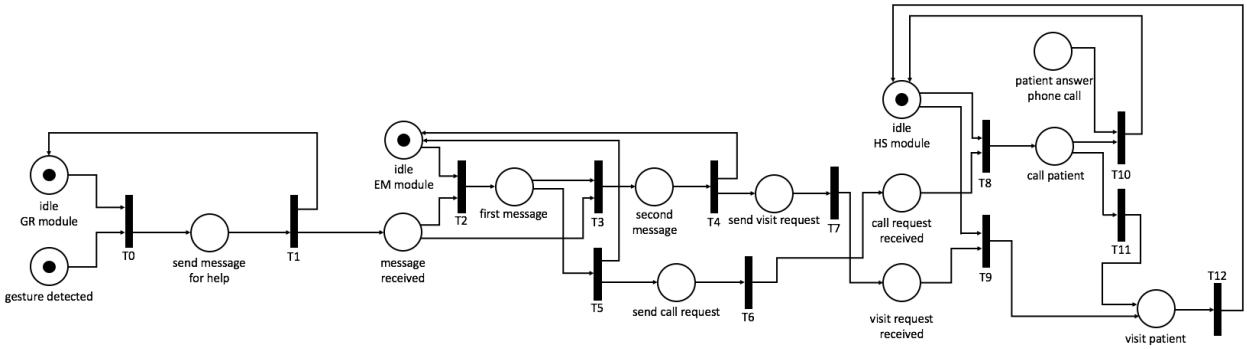

## (b) Take the diagram you drew in part (c) of Exercise 2. Redraw it here (because you may want to make some changes), and now use the marked Petri net to illustrate the scenario. You can draw a sequence of marked Petri net to show how the system works.

Now we can put the three systems together and illustrate how the system may work.

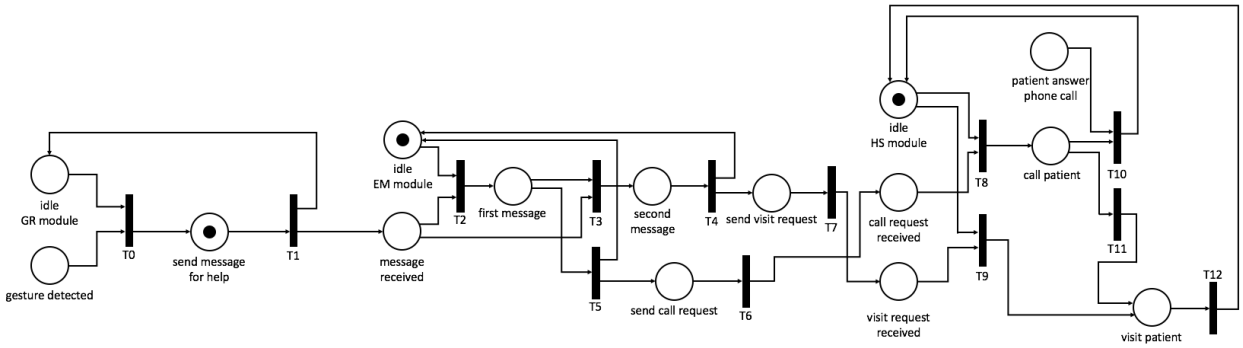
Initially the tokens are placed in the idle state of each module, as shown below.



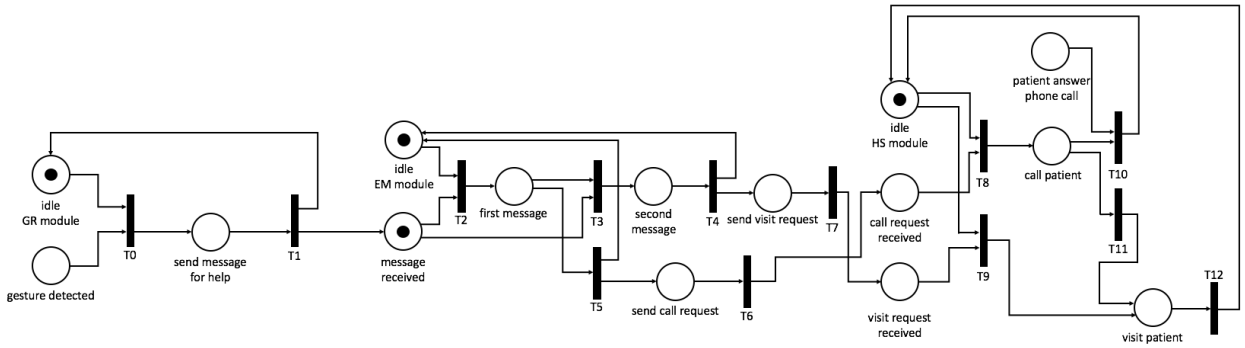

When the patient feels uncomfortable and activates the system with predefined gestures, a token will be added to the "gesture detected" place.



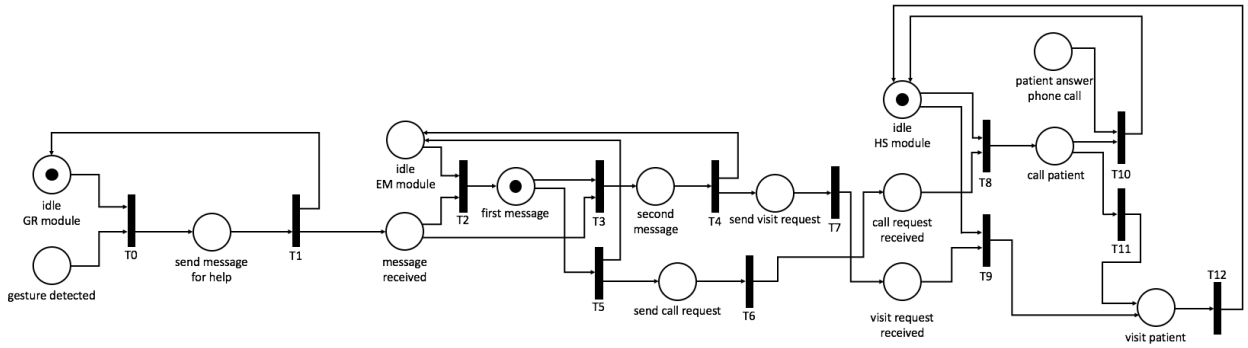

Now the transition is enabled and it will fire and deliver the token to next place. In other words, the system recognizes the gesture from patient and ready to send message for help.



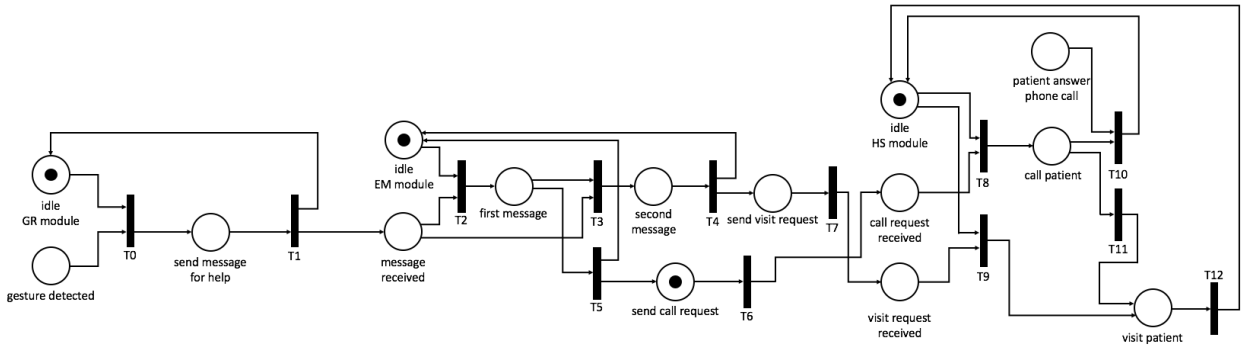

Next the message will be sent to the emergency manager module, and also reset the gesture recognition system to "idle" so that it could recognize other gestures.



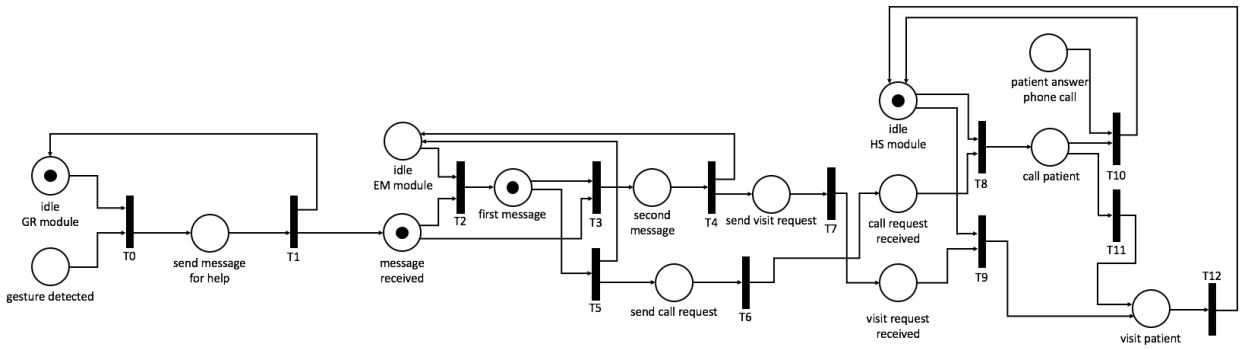

The emergency manager system receives the message and it is ready to fire the transition to transfer the token to “first message”.



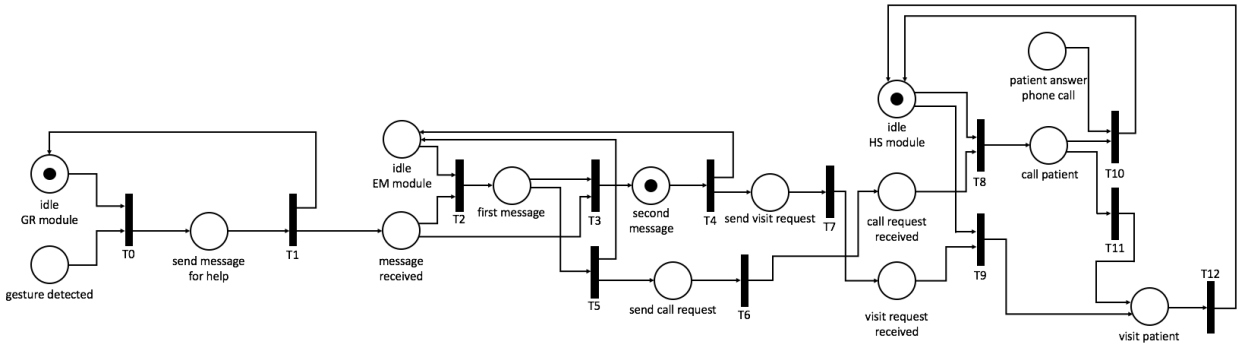

Notice that when the first message arrives, then transition `T3` is not enabled thus it can only fire `T5`, to indicate the homecare staff to call the patient. The emergency manager system is now reset to “idle”.



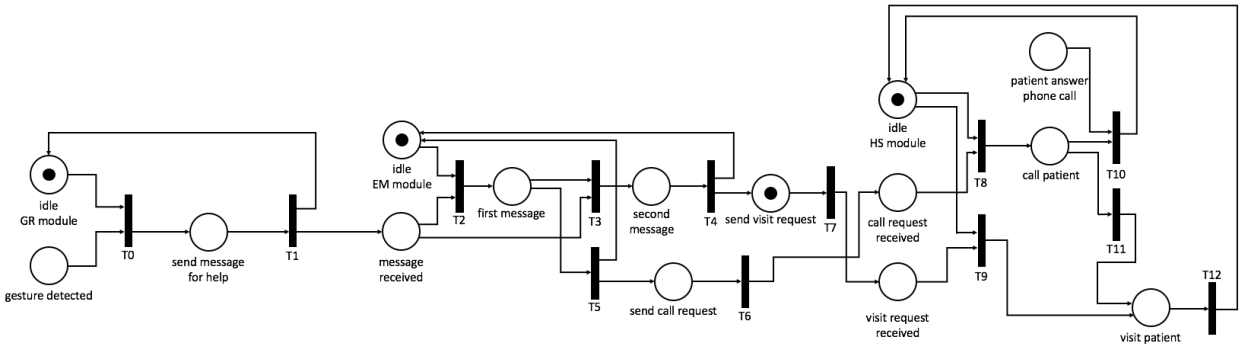

However, if the second message arrives before the above transition, then a token will be shown in “message received” place and now the `T3` transition is enabled.



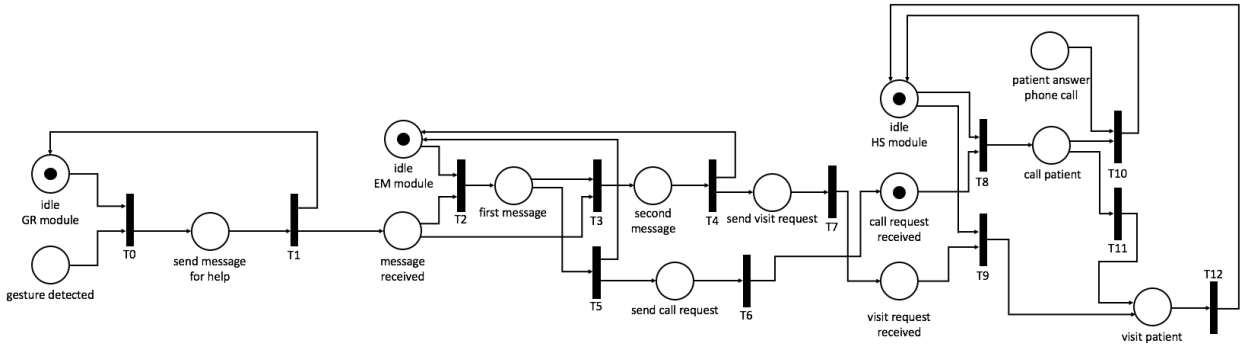

Then the transition will be fired.



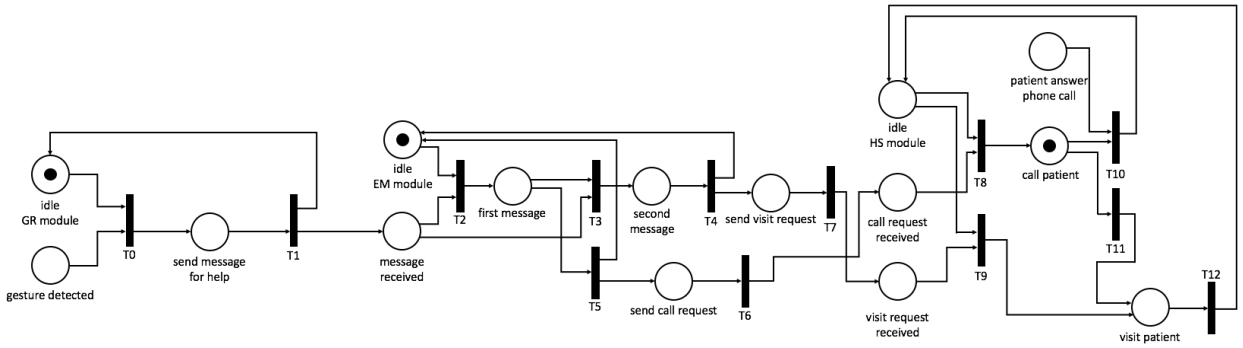

As the second message is arrived the emergency manager now is capable to make a decision to visit the patient. This also resets the emergency manager system to “idle”.



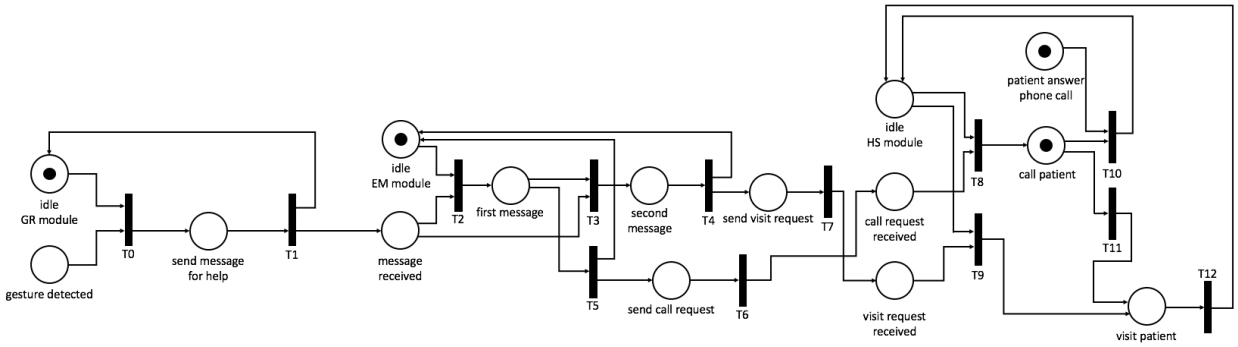

Now we first examine the situation when homecare staff gets the request of calling patient.



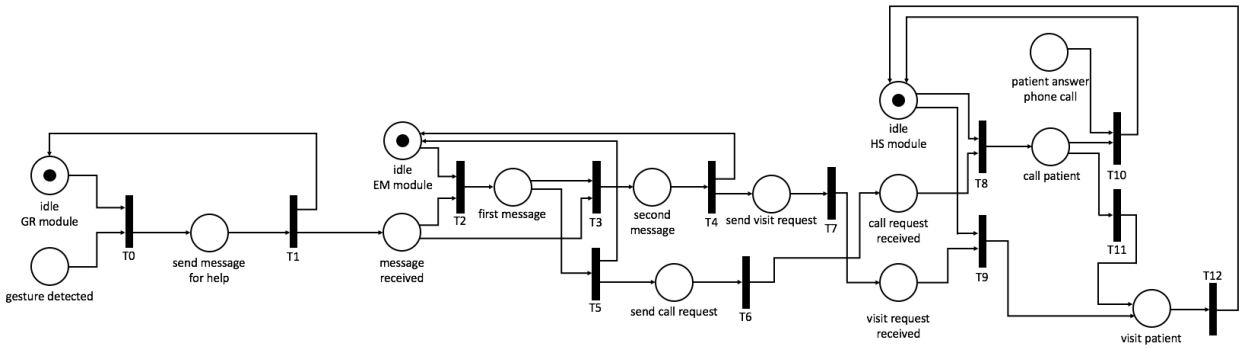

Note that now the “call patient” transition is enabled and it could be fired.



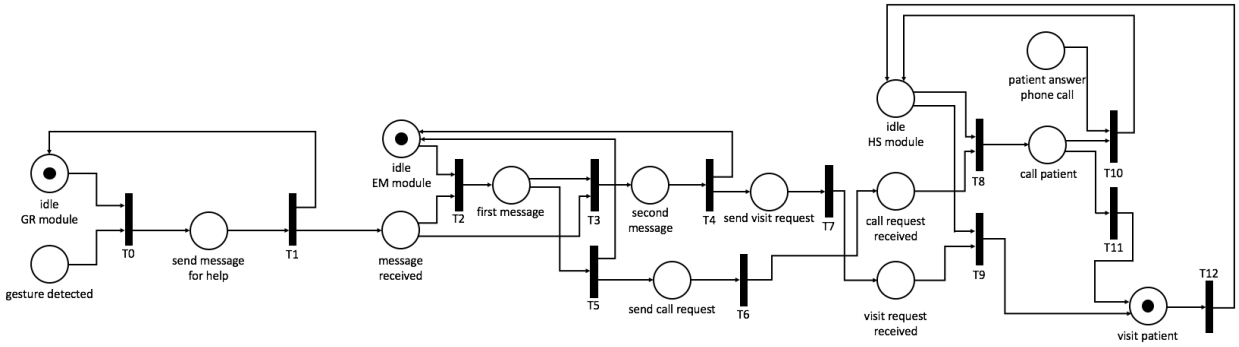

If the patient can answer the phone, then a token would be placed on the “patient answer phone call” place and the problem can be resolved (transition enabled).



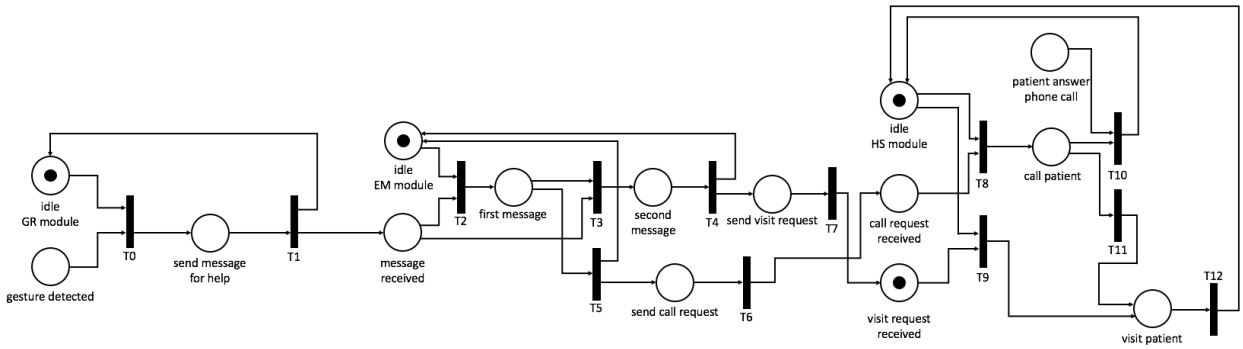

The homecare staff module is reset after the transition.




But if the phone call cannot connect to the patient, then the “call patient” request will be transitioned to “visit patient”.

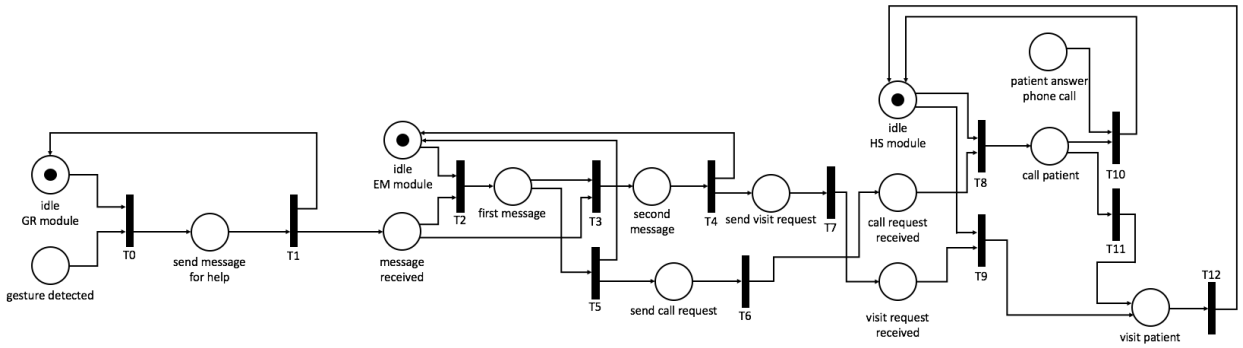



Another possibility is that the homecare staff gets the “visit patient” request directly.

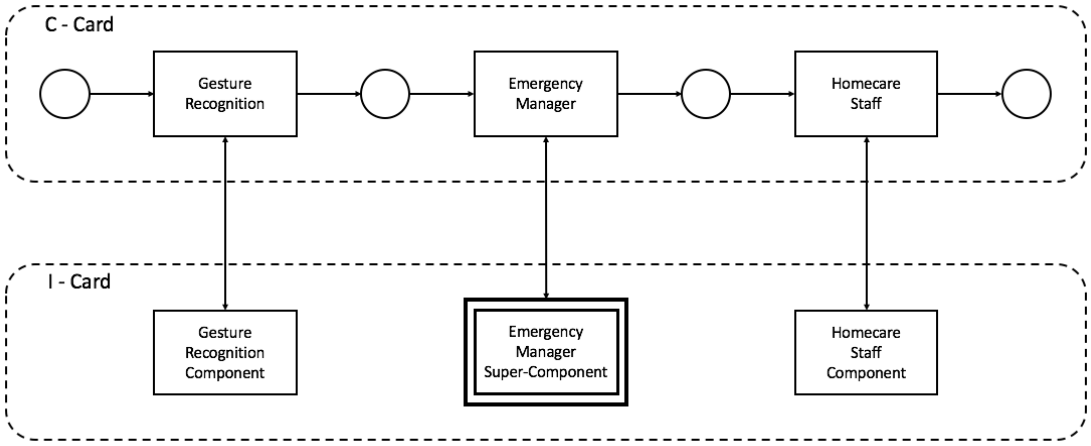



This will also lead to the token moved to “visit patient” place as we have seen above.

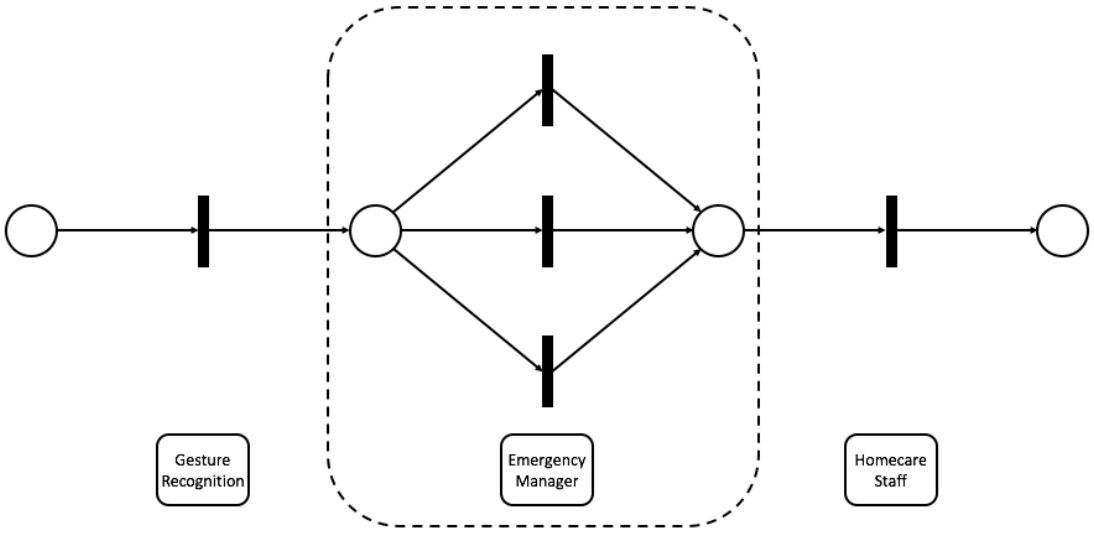
After visiting the patient, the system will also resets to “idle”.




**(c) Suppose the emergency manager index cell corresponds to a super-component, i.e., the emergency manager can enumerate a number of feasible solutions and select the most appropriate one. Draw the personal health care system as a pair of (I-card, C-card), and convert it into an ordinary Petri net. (To do that, you need to assume a specific number of feasible solutions for the emergency manager to evaluate. Let us say three.)**




The corresponding Petri Net is also shown below.


Gesture Recognition
Emergency Manager
Homecare Staff